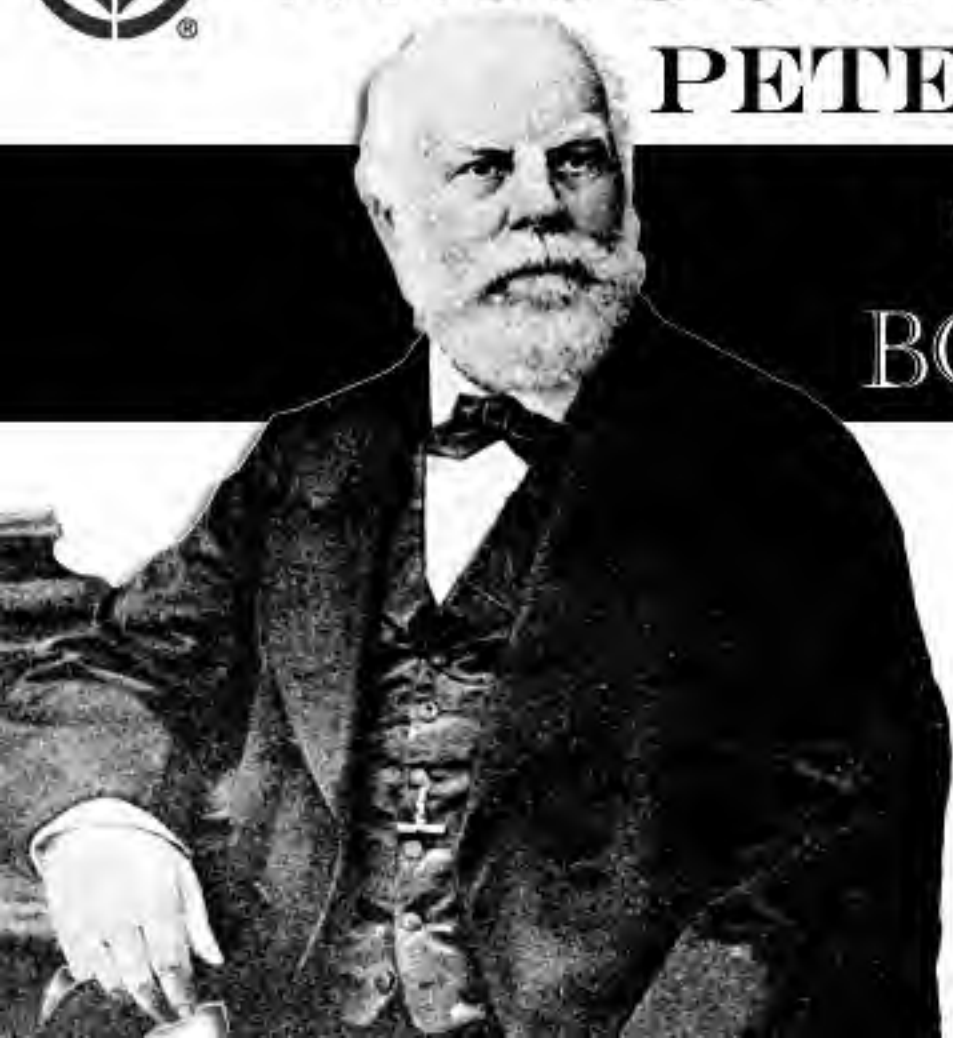




MISSOURI BOTANICAL GARDEN
PETER H. RAVEN LIBRARY



GEORGE ENGELMANN
BOTANICAL NOTEBOOKS

Pagination Note:

Since many of the items lack a specific page number, the page number displayed online refers to the sequentially created number each item was given upon cataloging the materials.

Additional Remarks on ATMOSPHERIC ELECTRICITY.

By A. WISLIZENUS, M.D.

The delay in the publication of this volume enables me to add to my observations of atmospheric electricity in 1861, the result of my observations in 1862. The latter observations have been made in the same manner and by means of the same fine glass thread, which, after many thousand torsions, proves as good as ever. I present herewith in tabular form the general result of my observations in 1861 and 1862.

I. *Monthly mean of Positive Atmospheric Electricity in 1861 and 1862, at St. Louis, Mo., based upon daily observations at 6, 9, 12, 3, 6 and 9 o'clock, from morning till night.*

| | Jan. | Feb. | Mar. | Ap'l. | May. | Jun. | Jul. | Aug. | Sept. | Oct. | Nov. | Dec. | Mean of Year. |
|--------|------|------|------|-------|------|------|------|------|-------|------|------|------|------------------|
| 1861*. | 16.5 | 12.1 | 9.8 | 8.8 | 7.8 | 4.0 | 3.7 | 3.4 | 3.0 | 7.1 | 10.0 | 14.3 | 8.4 |
| 1862.. | 12.1 | 16.0 | 9.4 | 10.6 | 7.5 | 3.0 | 2.2 | 2.3 | 3.0 | 7.7 | 12.6 | 13.9 | 8.4 |

* This table of 1861 differs in some decimals from that published on page 66 and in Diagram No. 1. Having discovered some errors, I calculated all my observations once more, and give now the present as the corrected table.

Monthly mean of Temperature and of Relative Humidity in

Wolfia

45-51



0 1 2 3 4 5 6 7 8 9 10
cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

IV. Direction of Winds and number of Thunderstorms in '61 & '62.

| 1861. | | E. | N. | N.E. | S.W. | N.W. | S. | W. | S.E. | Prevailing Winds. | Thunder- storms. |
|---------------|-----|-----|-----|------|------|------|-----|-----|-------------|-------------------|---------------------|
| January | 11 | 3 | 12 | 22 | 38 | 18 | 28 | 61 | S.E. | ..... | 0 |
| February | 4 | 2 | 2 | 35 | 24 | 19 | 41 | 60 | S.E. | ..... | 2 |
| March | 12 | 11 | 10 | 23 | 30 | 19 | 42 | 40 | W. & S.E. | ..... | 3 |
| April | 16 | 10 | 9 | 26 | 21 | 35 | 34 | 26 | S. & W. | ..... | 2 |
| May | 26 | 10 | 23 | 21 | 8 | 13 | 49 | 35 | W. & S.E. | ..... | 5 |
| June | 12 | 21 | 22 | 20 | 25 | 26 | 8 | 41 | S.E. | ..... | 7 |
| July | 3 | 31 | 14 | 21 | 26 | 46 | 15 | 29 | S. | ..... | 3 |
| August | 18 | 24 | 58 | 17 | 11 | 18 | 3 | 37 | N.E. | ..... | 5 |
| September... | 6 | 14 | 18 | 23 | 30 | 13 | 21 | 52 | S.E. & N.W. | ..... | 3 |
| October | 12 | 9 | 5 | 21 | 30 | 33 | 30 | 46 | S.E. & S. | ..... | 1 |
| November... | 7 | 15 | 8 | 22 | 27 | 20 | 36 | 44 | S.E. & W. | ..... | 1 |
| December ... | 9 | 19 | 9 | 25 | 23 | 33 | 17 | 51 | S.E. & S. | ..... | 0 |
| | 136 | 169 | 190 | 279 | 293 | 293 | 324 | 522 | S.E. | ..... | 32 |

| 1862. | | E. | S.W. | N. | N.E. | W. | S. | N.W. | S.E. | Prevailing Winds. | Th. st's. |
|------------|----|----|------|----|------|----|----|------|--------------------------|-------------------|--------------|
| Jan. | 19 | 6 | 19 | 23 | 29 | 3 | 51 | S.E. | ..... | ..... | 1 |
| Feb. | 14 | 9 | 18 | 16 | 22 | 7 | 43 | 39 | S.E. & N.W. | ..... | 0 |
| March ... | 9 | 14 | 3 | 15 | 59 | 10 | 43 | 34 | W., S.E. & N.W. | ..... | 4 |
| April | 12 | 13 | 18 | 31 | 18 | 11 | 47 | 34 | S.E., N.W. & N.E. | ..... | 6 |
| May | 12 | 18 | 14 | 38 | 18 | 30 | 44 | 14 | S.E. & N.E. | ..... | 5 |
| June | 3 | 29 | 24 | 1 | 8 | 2 | | | S., S.W., N.W. & S.E. | ..... |  |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Ex Herb. J. Engelmann

Wolffia Columbiana, Karst.

subimmersa, major, sphaeridea, grandicellulosa,
concolor, stomatibus paucissimis; circa tenuis-
sima margine obscuriore cincta; et

Wolffia Brasiliensis, Wedd.

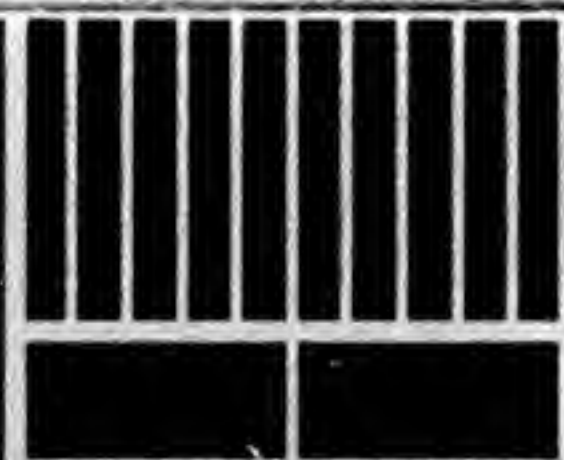
var. borealis

nataans, minor, oblonga, antice subarata, parvi-
cellulosa, densior, supra lacte viridis, subius
pallida, plus minus brunco-maculata, stoma-
tibus plurimis; circa tenuis, concolor (si
verticaliter compressa) vel margine superiore
recto obscuriore (si a latere compressa).

In lacu quodam inter Springfield et
Athens in Illinois centrali, abunde cum
Lemnis, Ceratophyllo, Anacharide, etc.

Leg. Elisha Hall,

Sept. 1867.



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7864

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Ex Herb. J. Engelmann

Wolffia Columbiana, Karst.

subimmersa, major, sphaeridea, grandicellulosa,
concolor, stomatibus paucissimis; circa tenuis-
sima margine obscuriore cincta; et

Wolffia Brasiliensis, Wedd.

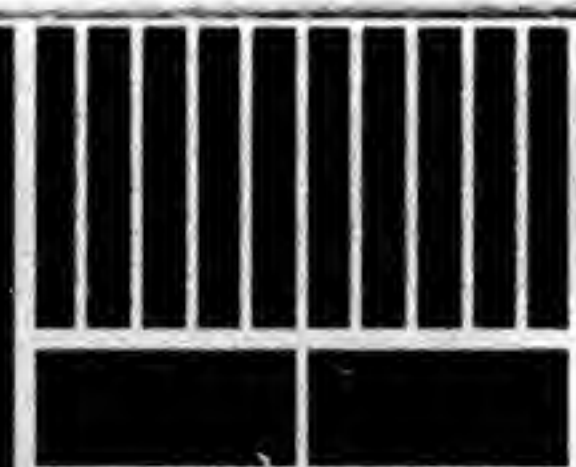
var. borealis

natans, minor, oblonga, antice subacuta, parvi-
cellulosa, densior, supra lacte viridis, subius
pallida, plus minus bruno-maculata, stoma-
tibus plurimis; circa tenuis, concolor (si
verticaliter compressa) vel margine superiore
recto obscuriore (si a latere compressa).

In lacu quodam inter Springfield et
Athens in Illinois centrali, abunde cum
Lemnis, Ceratophyllo, Anacharide, etc.

Leg. Elisha Hall,

Sept. 1867.



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7865

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Wolffia

1839

Lemnaceae Schlecht in Linnaea 13. p. 388

Wolffia Selitii Schlecht. : labium inferius rimae
bas. tantis productum, appendicem hyalinam
frondiculum tenuissimum ~~(ovales)~~
Cotton & Germann Flore de Paris 1861

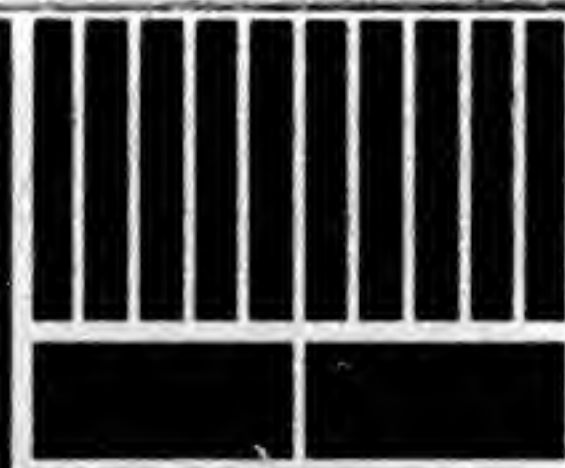
p. 716 Wolffia arrhiza (Linn. Linn.)
W. Muhlenb. Schlecht

frondes subglobosae lentes, prope planas en
dessus, très ruguleuses en dessous - la plante
geminipare à levres entières
embrassant étroitement le jeune fronde

Guy Man 3^e éd. 1867

p. 480 Wolffia Columbiana Karst. frond lenticular
the chink at the base appendages by an
expanded hyaline border.

ovus



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Kunth vol 3 p. 4

over

has nothing satisfactory about

Wolffia

Lemma ~~whip~~ *L* is still,
with him, as with Schlecht
allied to *L. gibba*! never

flowers seen

Wolffia *deltoidea*

Wolffia *deltoidea* *Wolff* *Ann.* 3. 496

Lemma

Lemma *deltoidea* *Wolff* *Ann.* 9. 267

deltoidea *Wolff*

W. Columbiana *Karst.* *Botan. Notwendig*

l. p. 103. deltoidea.

W. deltoidea *Hegel.* *Scen. Joan*

deltoidea *1865 p. 114*

W. deltoidea *Wiedell.* *Ann. sc. nat.* 3^e ser
XII. 109. t. 8

COR. 4TH & OLIVE STS. ST. LOUIS

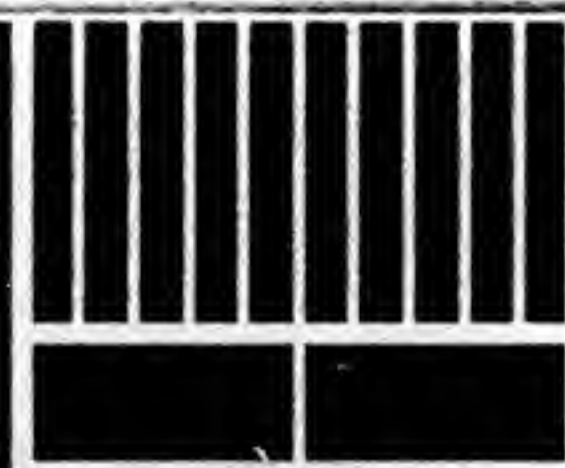
APOTHECARY & PHARMACEUTIST

ALEX. LEITCH

GEORGE ENGELMANN PAPERS

MISSOURI BOTANICAL GARDEN

7867



0 1 2 3 4 5 6 7 8 9 10

cm

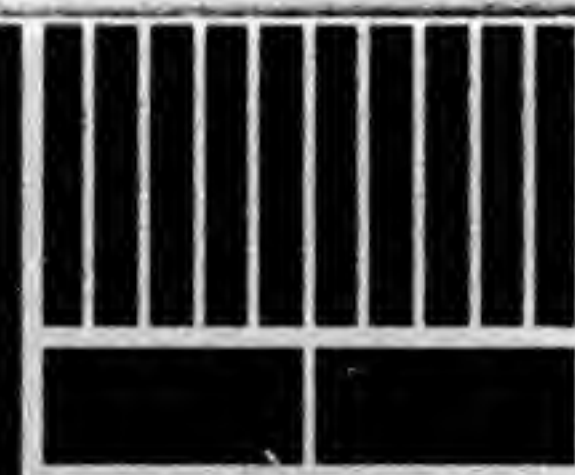
copyright reserved



MISSOURI
BOTANICAL
GARDEN

Dimensions in millimet

| | Length of single frond | Length of stomate & thin cells |
|--|---------------------------|--------------------------------------|
| <i>W. arborescens</i> , Europe | 0.6 - 0.8 | 0.032 - 0.035 |
| <i>W. Brasilensis</i> var. <i>W. Brasilensis</i> | 0.4 - 0.8 | 0.016 - 0.017 |
| — — — — — <i>Angela</i> | 0.5 - 1.0 | 0.023 - 0.026 |
| — — — — — <i>Am. bor.</i> | 0.7 - 1.2 | 0.025 - 0.028 |
| <i>W. Columbianum</i> " " | 0.6 - 1.5 | 0.034 - 0.036 |
| <i>W. Welwitschii</i> Cuba | 4.0 | none |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7866

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

Leitch & Corlies

DRUGGISTS

South West
Corner Fifth
and Market
Streets



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Karsten, Botan. Untersuchungen I p. 104

Wolffii Columbiana n. sp. kist ein drüsenloses, und
mit einer Galtöffnung n. sp.

W. Brasilensis Wedd. mit nuzigen drüsen, und
in der folgenden mit vielen Galtöffnungen

W. arhiza Wäcker atzet borzig-nuzig.

" ist ein total verfallene Analyse der fruchtlose
nach Abbildung der W. Columbiana.

Hederaelett Oct 3
1867



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7868

Eugene L. Massot,

DISPENSER OF

PURE MEDICINES,

THE FINER CHEMICALS,

And Reliable Pharmaceutical Preparations,

CORNER OF FOURTH AND SPRUCE STREETS,

ST. LOUIS, MO.

MISSOURI BOTANICAL GARDEN

GEORGE ENGELMANN PAPERS



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN



top view



section

flowering Wolffii Delile's siphon
Schleiden in Kny's Iconographia

fructulus ovalis tenuissimus (Schleiden) ^{magnif.}

Wolffii antige see Hoffmann Arnold
Sc. Nat. 2^e Ser t. 14 p. 226



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7869

**ENNO SANDER & CO.,
PHARMACEUTISTS,**

Cor. 2d & Walnut, under Barnum's Hotel,

Cor. 4th & Walnut, under Southern Hotel,

ST. LOUIS, MO.

M.

BOTANICAL

GEORGE ENGELMANN PAPERS



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



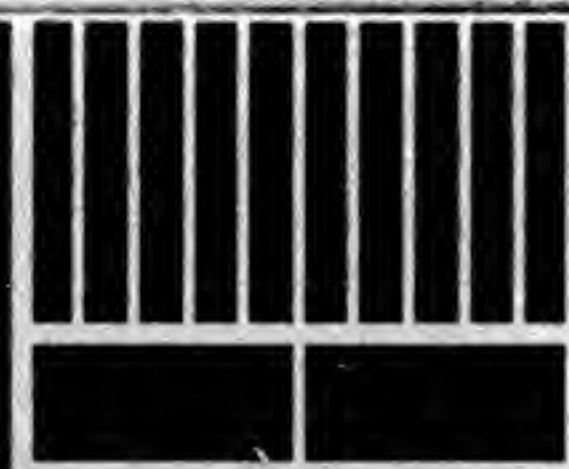
MISSOURI
BOTANICAL
GARDEN

^{Aug 24}
Wolffia ambigua flatfish or rather slightly
convex, green, and full of stomata above
venterose and pale below; rather sharp
on the posterior edge; vima circular,
closely adpressed.

a. Gemmae, Europeae: without
brown spots; stomata 20-30; Leipzig

β. maculata, Americana, dotted with
brown spots; stomata 30-100 - Orange Co., N.Y.
& Detroit - with the next.

Wolffia Columbiana Karst. Nearly globose, ^{sandy}
not flat above, uniformly very pale green
all over, with very few (3-6) stomata. vima
circular, closely adpressed - larger than last.
Orange N.Y. Detroit, Illinois.



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

7870

ENNO SANDER & CO.,
PHARMACEUTISTS,

Cor. 4th & Walnut, under Southern Hotel,

Cor. 2d & Walnut, under Barnum's Hotel,

ST. LOUIS, MO.

Linbon per Doctor

Maryann's

in brown vinyon, as in vinyon

in Carees triangularis

blüthen, pectus in vinyon

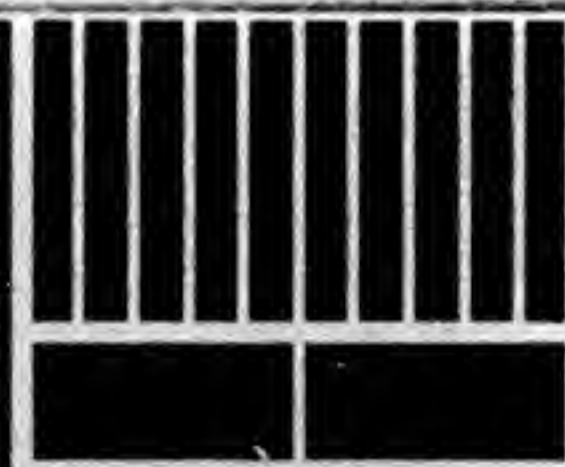
in vinyon, on glass of vinyon

in vinyon

in vinyon

in vinyon

in vinyon



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

1. Wolffia Dilili Schleid. Linn 13. 389. etc. frondibus arhizis
 $\frac{1}{4}$ lin longis, oblongo-globosis, supra stomatiforme convexiusculis
subtus globosis efflatis, laxa irregulariter hexagono-cellulosa
hyalina

α . Dilili frondibus duplo triplo majoribus, superficie
magis distincta: granis globosis Griff. not. p. 229. t. 267. 2

β . Schleideni frondibus $\frac{1}{4}$ lin magnis magis cylindricis
superficie superius convexiuscula (Wolffia Schleideni Griseb.)
stemma globosa Rab)

2. W. microscopica Kütz. & granis microscopica Griff.
not. 226. t. 266 - 268 frondibus lineam vix excedentes
cellulosae super planiusculae subtus in radulam(?)

subcylindricae productae; pollen glabrum

Tab V.

1
not 1/2



top view

10
not 1/2



top



0
cm

1

2

3

4

5

6

7

8

9

10

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7871

Why is this not *W. ambigua*? Is *Silene* is "tenuissima"

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Wolffia Welwitschii
Cuba

41.

246

B.-MONTHLY SUMMARY OF SCIENCE.

3.—Monthly mean of relative Humidity.

MARCH.

| YEAR. | AT 6 A.M. | 9 A.M. | 12 M. | 3 P.M. | 6 P.M. | 9 P.M. | MEAN OF MONTH. |
|-----------|--------------|--------|-------|--------|--------|--------|----------------------|
| 1861..... | 83.3 | 63.7 | 58.9 | 52.4 | 58.9 | 70.1 | 64.5 |
| 1862..... | 85.1 | 76.2 | 64.4 | 60.4 | 65.5 | 73.0 | 70.8 |
| 1863..... | 87.7 | 71.5 | 57.8 | 55.4 | 63.0 | 73.0 | 68.1 |
| 1864..... | 85.6 | 69.5 | 59.3 | 58.8 | 68.8 | 78.1 | 70.0 |
| Mean..... | 85.4 | 70.2 | 60.1 | 56.7 | 64.1 | 73.5 | 68.3 |

APRIL.

| | | | | | | | |
|-----------|------|------|------|------|------|------|------|
| 1861..... | 77.4 | 62.4 | 53.2 | 51.7 | 57.3 | 67.2 | 61.5 |
| 1862..... | 82.0 | 68.3 | 57.3 | 55.9 | 63.0 | 75.8 | 67.0 |
| 1863..... | 76.5 | 57.8 | 46.9 | 43.9 | 53.0 | 65.4 | 57.2 |
| 1864..... | 85.1 | 72.7 | 62.2 | 57.6 | 63.2 | 77.8 | 69.8 |
| Mean..... | 80.1 | 65.3 | 54.9 | 52.3 | 59.1 | 71.5 | 63.9 |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

III.—ATMOSPHERIC ELECTRICITY, TEMPERATURE AND HUMIDITY.

*Observations made at St. Louis, Mo., based upon daily observations
at 6, 9, 12, 3, 6 and 9 o'clock, from morning till night. By A.
WISLIZENUS, M. D., Saint Louis, Mo.*

1.—Monthly mean of positive Atmospheric Electricity.

MARCH.

| YEAR. | AT 6 A. M. | 9 A. M. | 12 M. | 3 P. M. | 6 P. M. | 9 P. M. | MEAN OF MONTH. | NO. OF THUNDER STORMS. | PREVAILING WINDS. |
|-----------|---------------|---------|-------|---------|---------|---------|----------------------|------------------------------|-------------------|
| 1861..... | 12.0 | 12.0 | 9.8 | 8.1 | 9.0 | 8.0 | 9.8 | 3 | W. & S.E. |
| 1862..... | 11.8 | 12.8 | 9.4 | 8.4 | 7.0 | 6.8 | 9.4 | 4 | W., S.E. & N.W. |
| 1863..... | 15.8 | 15.5 | 16.5 | 10.4 | 11.1 | 12.3 | 13.6 | 2 | NW.W. NE. SE. |
| 1864..... | 9.1 | 11.6 | 6.8 | 7.5 | 7.8 | 8.0 | 8.5 | 3 | S.E. |
| Mean.... | 12.2 | 13.0 | 10.6 | 8.6 | 8.7 | 8.8 | 10.3 | .... | ..... |

APRIL.

| YEAR. | AT 6 A. M. | 9 A. M. | 12 M. | 3 P. M. | 6 P. M. | 9 P. M. | MEAN OF MONTH. | NO. OF THUNDER STORMS. | PREVAILING WINDS. |
|-----------|---------------|---------|-------|---------|---------|---------|----------------------|------------------------------|-------------------|
| 1861..... | 10.8 | 11.1 | 7.1 | 7.0 | 7.7 | 9.3 | 8.8 | 2 | S. & W. |
| 1862..... | 10.7 | 13.7 | 10.6 | 9.1 | 9.4 | 10.1 | 10.6 | 6 | SE., NW. & NE. |
| 1863.. | 10.0 | 9.9 | 10.0 | 6.2 | 8.0 | 8.6 | 8.8 | 2 | S.E. & N.W. |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



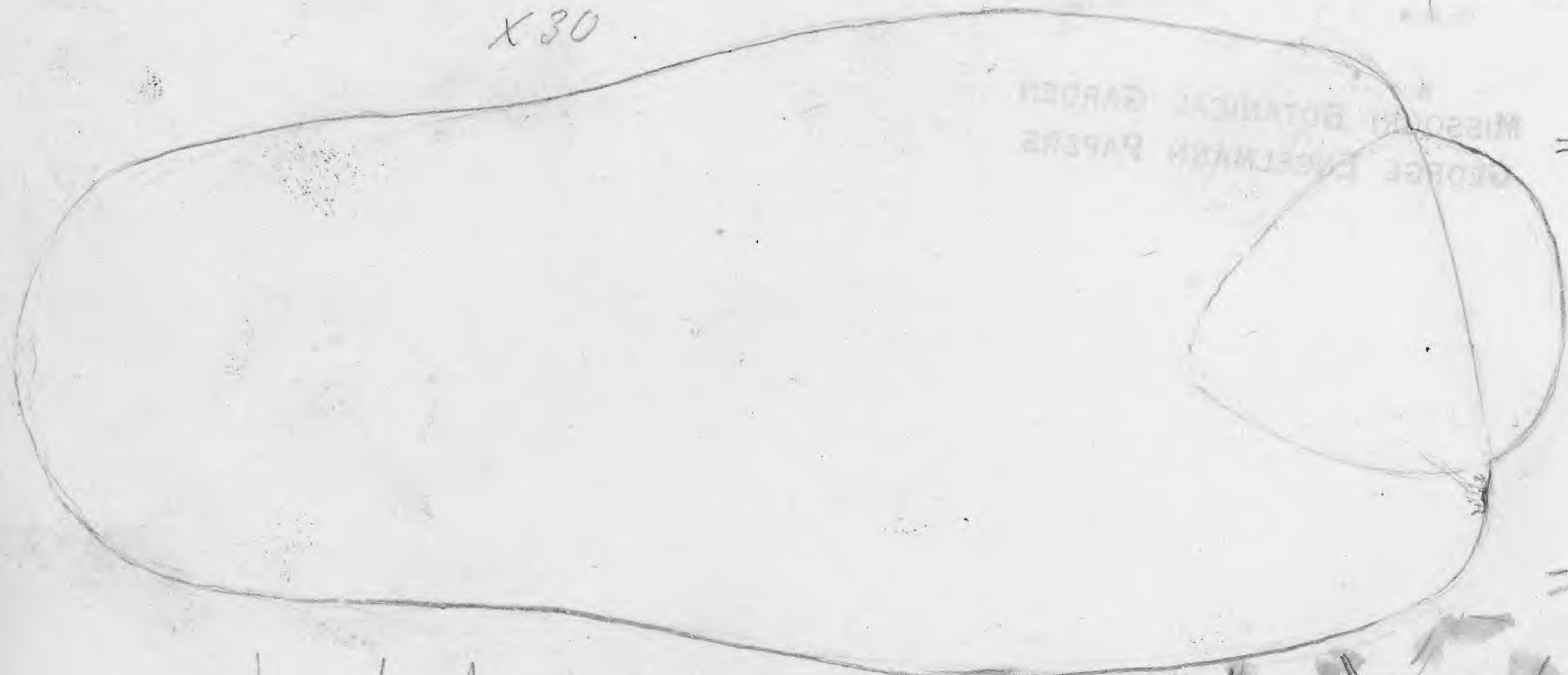
MISSOURI
BOTANICAL
GARDEN

Wolffia Wolawitschii Hegelen July 4 1867
W. proxima C. F. Aust in litt.

frond extremely thin

Cuba, Wright, mixed with 3215
 (Lemna peruviana)

x30

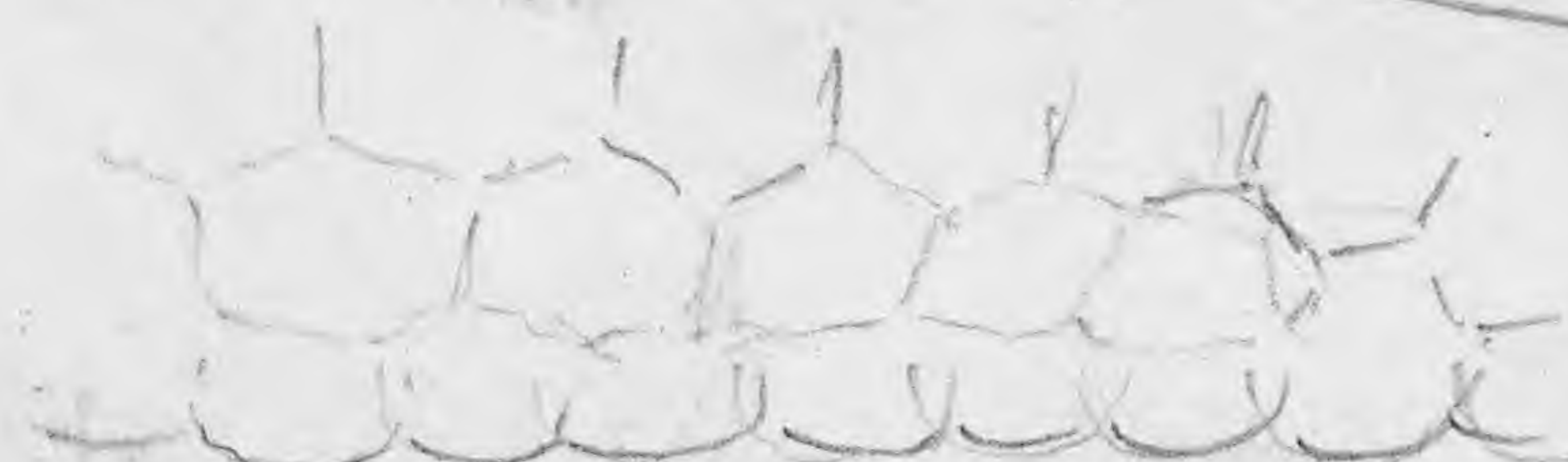


surface cell,
in another
part



marked
cells on surface

x280



Thin margin of frond x280

Brown cells
Dotted
over
the surface
x280



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Alex. Leitch,
APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

7873



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Wolffia Wolwitschii

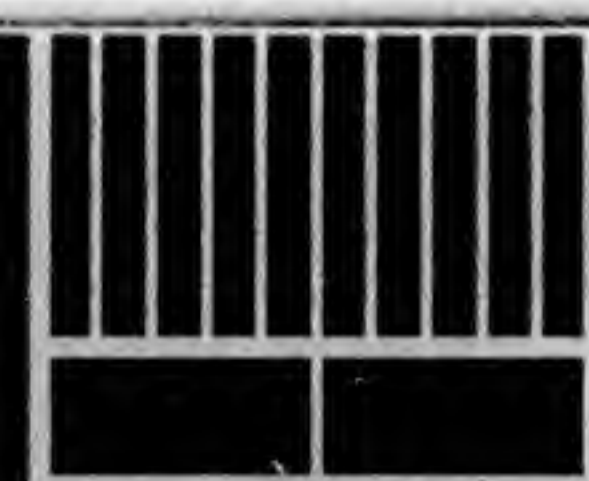
Wright, Cuba

with Lemna

x30

Sept 13 1867

5 mm long
2-2 1/2 - wide



0
cm

1

2

3

4

5

6

7

8

9

10

copyright reserved



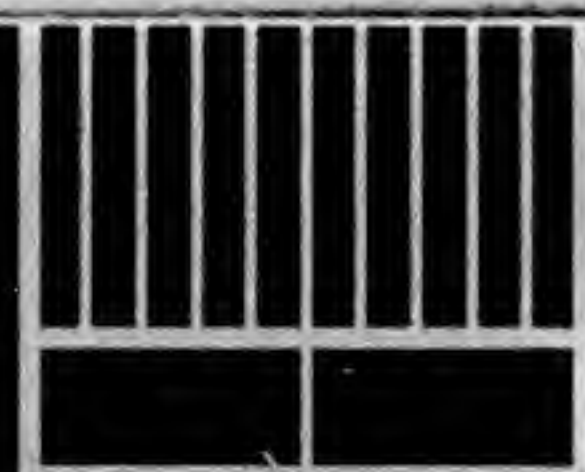
MISSOURI
BOTANICAL
GARDEN

7874

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

JONES & LETTCH
Druggists
Cor. Fifth & Market Sts. ST. LOUIS, MO.

J. H. KILBICK & CO. 36 N. Main St.



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Wolffia arrhiza

Europaea

43-4

246

BI-MONTHLY SUMMARY OF SCIENCE.

3.—Monthly mean of relative Humidity.

MARCH.

| YEAR. | AT 6 A.M. | 9 A.M. | 12 M. | 3 P.M. | 6 P.M. | 9 P.M. | MEAN OF MONTH. |
|-----------|--------------|--------|-------|--------|--------|--------|----------------------|
| 1861..... | 83.3 | 63.7 | 58.9 | 52.4 | 58.9 | 70.1 | 64.5 |
| 1862..... | 85.1 | 76.2 | 64.4 | 60.4 | 65.5 | 73.0 | 70.8 |
| 1863..... | 87.7 | 71.5 | 57.8 | 55.4 | 63.0 | 73.0 | 68.1 |
| 1864..... | 85.6 | 69.5 | 59.3 | 58.8 | 68.8 | 78.1 | 70.0 |
| Mean..... | 85.4 | 70.2 | 60.1 | 56.7 | 64.1 | 73.5 | 68.3 |

APRIL.

| | | | | | | | |
|-----------|------|------|------|------|------|------|------|
| 1861..... | 77.4 | 62.4 | 53.2 | 51.7 | 57.3 | 67.2 | 61.5 |
| 1862..... | 82.0 | 68.3 | 57.3 | 55.9 | 63.0 | 75.8 | 67.0 |
| 1863..... | 76.5 | 57.8 | 46.9 | 43.9 | 53.0 | 65.4 | 57.2 |
| 1864..... | 85.1 | 72.7 | 62.2 | 57.6 | 63.2 | 77.8 | 69.8 |
| Mean..... | 80.1 | 65.3 | 54.9 | 52.3 | 59.1 | 71.5 | 63.9 |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

III.—ATMOSPHERIC ELECTRICITY, TEMPERATURE
AND HUMIDITY.

*Observations made at St. Louis, Mo., based upon daily observations
at 6, 9, 12, 3, 6 and 9 o'clock, from morning till night. By A.
WISLIZENUS, M. D., Saint Louis, Mo.*

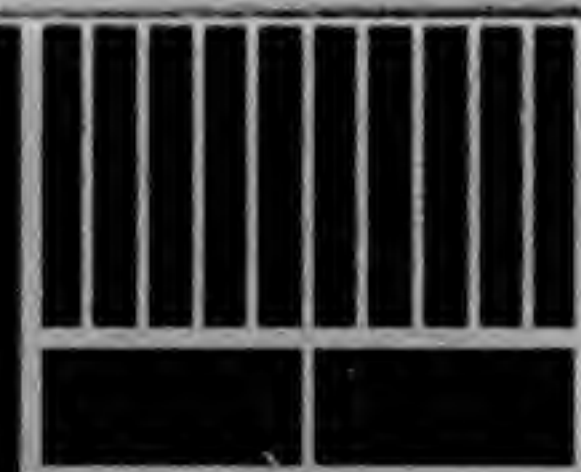
1.—Monthly mean of positive Atmospheric Electricity.

MARCH.

| YEAR. | 6 A. M. | 9 A. M. | 12 M. | 3 P. M. | 6 P. M. | 9 P. M. | MEAN OF MONTH. | NO. OF THUNDER STORMS. | PREVAILING WINDS. |
|-----------|---------|---------|-------|---------|---------|---------|----------------------|------------------------------|-------------------|
| 1861..... | 12.0 | 12.0 | 9.8 | 8.1 | 9.0 | 8.0 | 9.8 | 3 | W. & S.E. |
| 1862..... | 11.8 | 12.8 | 9.4 | 8.4 | 7.0 | 6.8 | 9.4 | 4 | W., S.E. & N.W. |
| 1863..... | 15.8 | 15.5 | 16.5 | 10.4 | 11.1 | 12.3 | 13.6 | 2 | NW.W. NE. SE. |
| 1864..... | 9.1 | 11.6 | 6.8 | 7.5 | 7.8 | 8.0 | 8.5 | 3 | S.E. |
| Mean..... | 12.2 | 13.0 | 10.6 | 8.6 | 8.7 | 8.8 | 10.3 | .... | ..... |

APRIL.

| YEAR. | 6 A. M. | 9 A. M. | 12 M. | 3 P. M. | 6 P. M. | 9 P. M. | MEAN OF MONTH. | NO. OF THUNDER STORMS. | PREVAILING WINDS. |
|-----------|---------|---------|-------|---------|---------|---------|----------------------|------------------------------|-------------------|
| 1861..... | 10.8 | 11.1 | 7.1 | 7.0 | 7.7 | 9.3 | 8.8 | 2 | S. & W. |
| 1862..... | 10.7 | 13.7 | 10.6 | 9.1 | 9.4 | 10.1 | 10.6 | 6 | SE., NW. & NE. |
| 1863..... | 10.0 | 9.9 | 10.0 | 6.2 | 8.0 | 8.6 | 8.8 | 2 | S.E. & N.W. |
| Mean..... | 10.5 | 11.6 | 9.2 | 7.4 | 8.4 | 9.3 | 9.4 | .... | ..... |



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



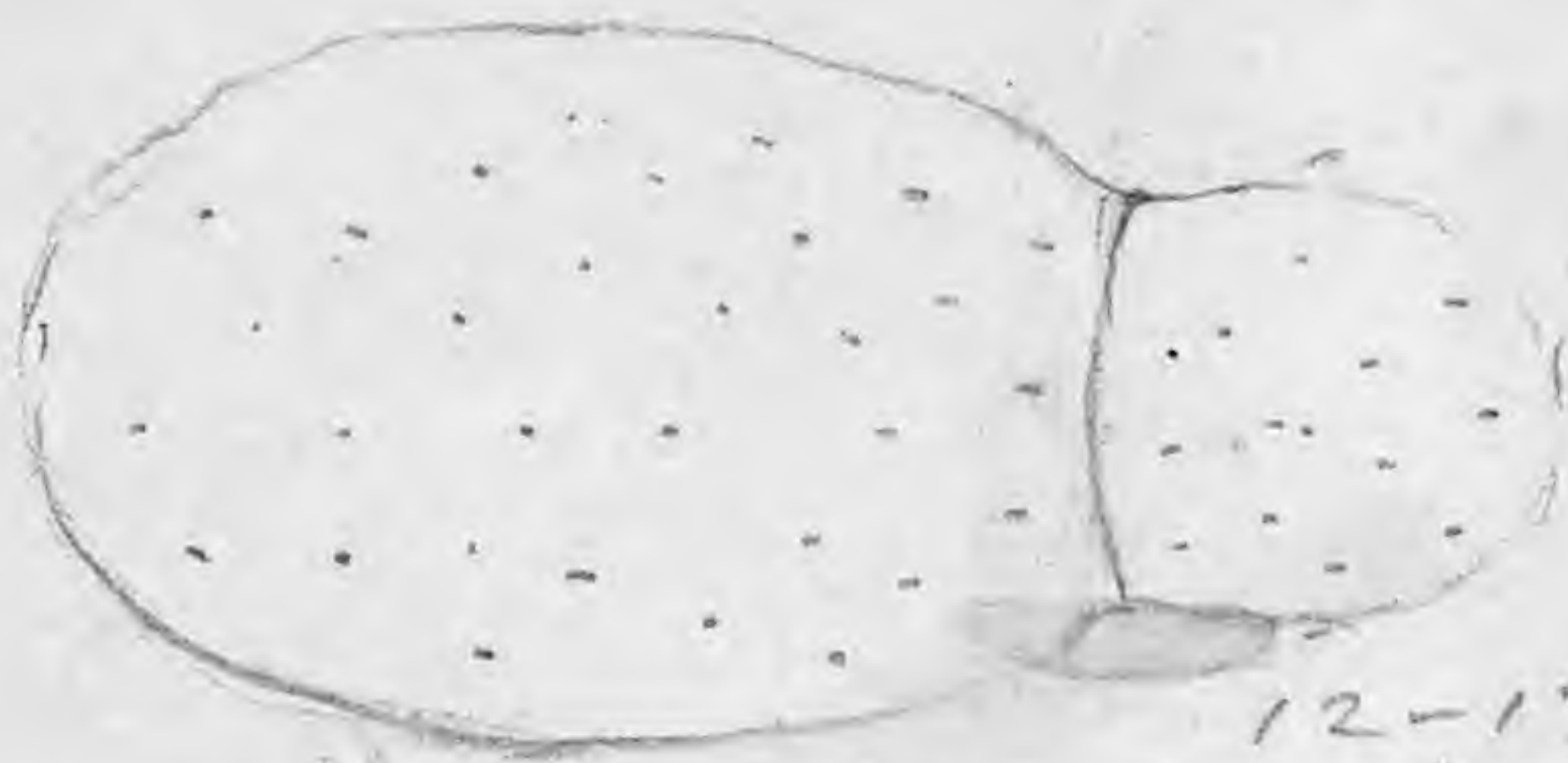
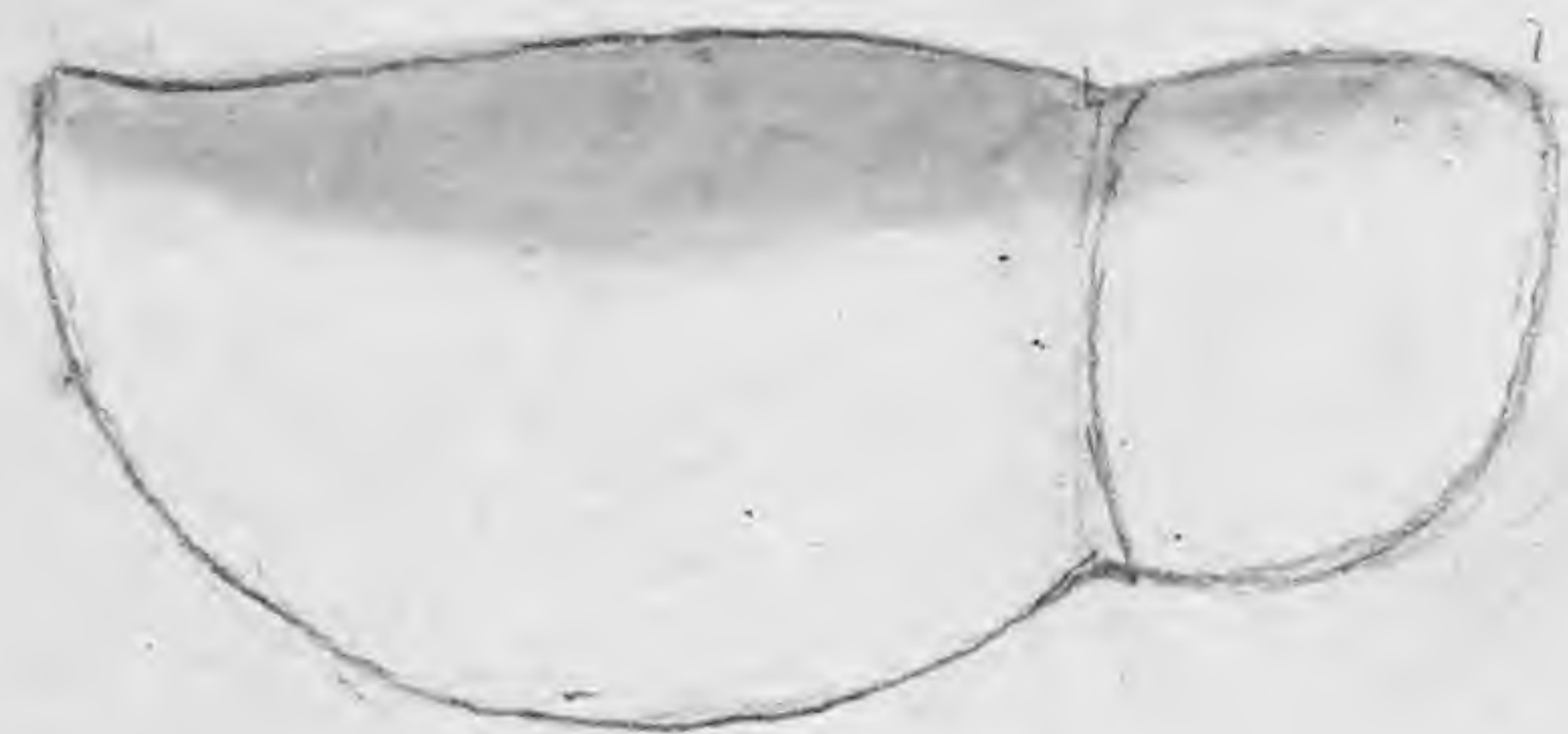
MISSOURI
BOTANICAL
GARDEN

x30

Wolffia arrhiza
Leipzig

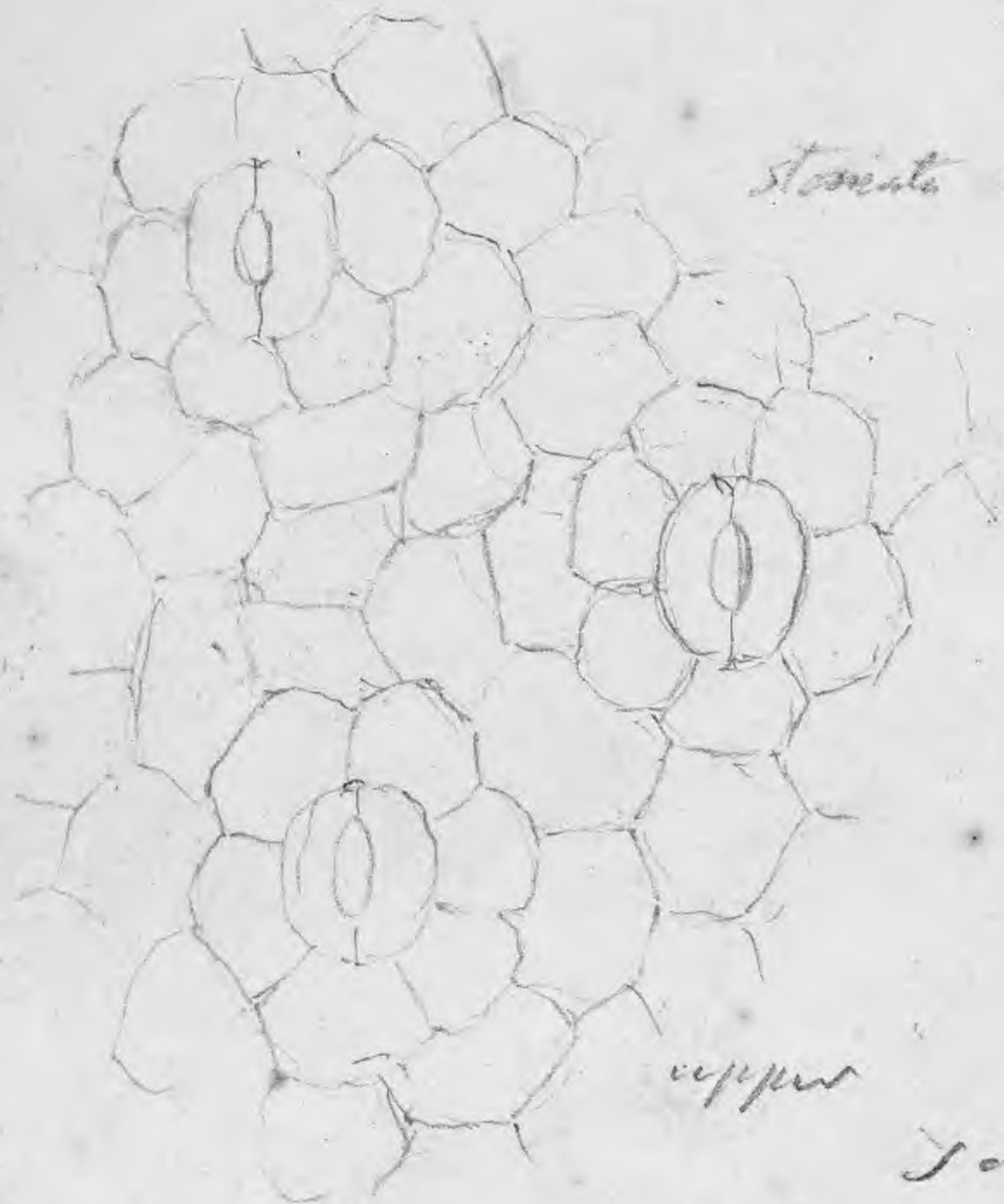
May 24

1867

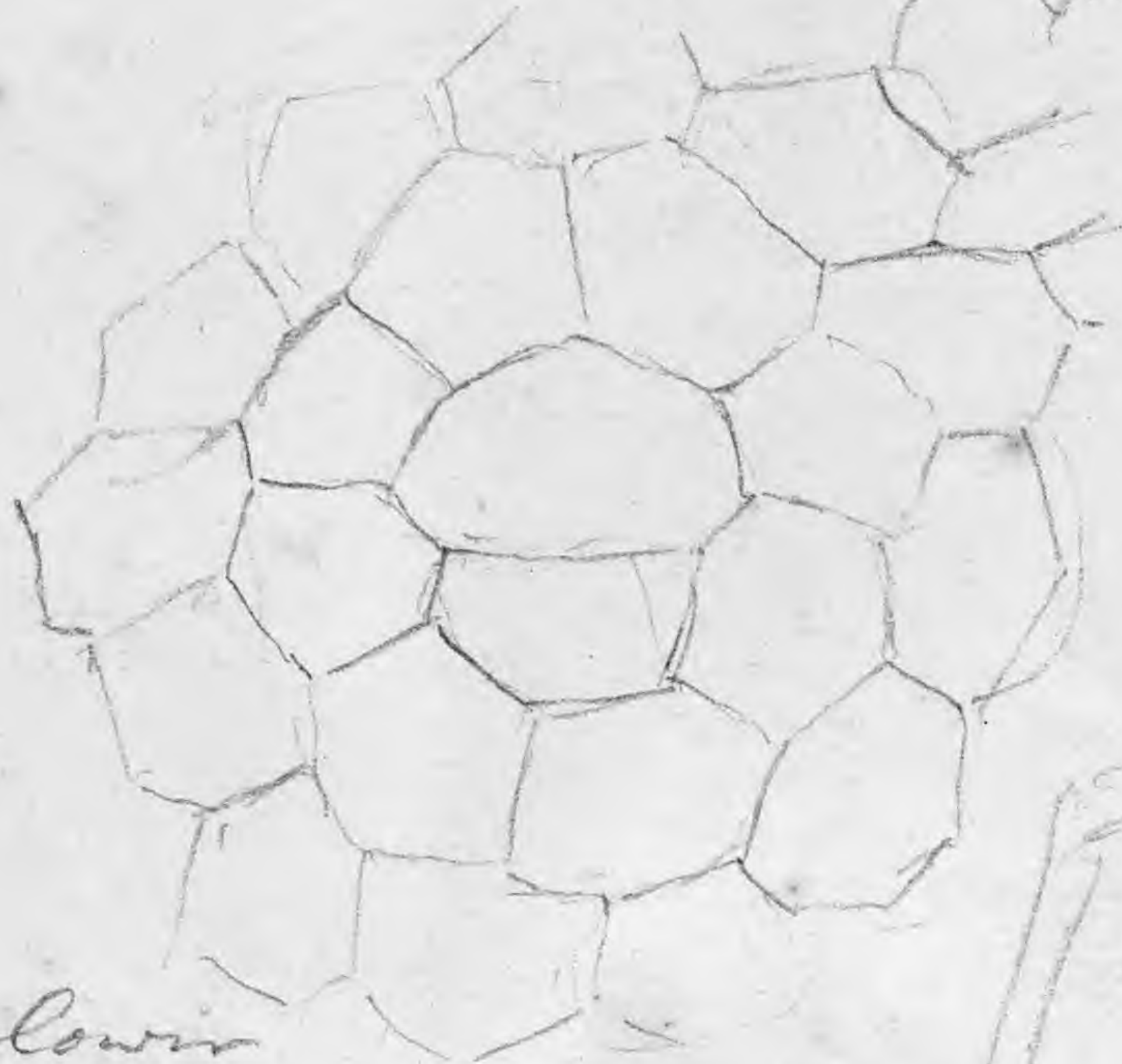


12-13
25-30 stomata stom.
no brown spots

stomata 0.035 mm by

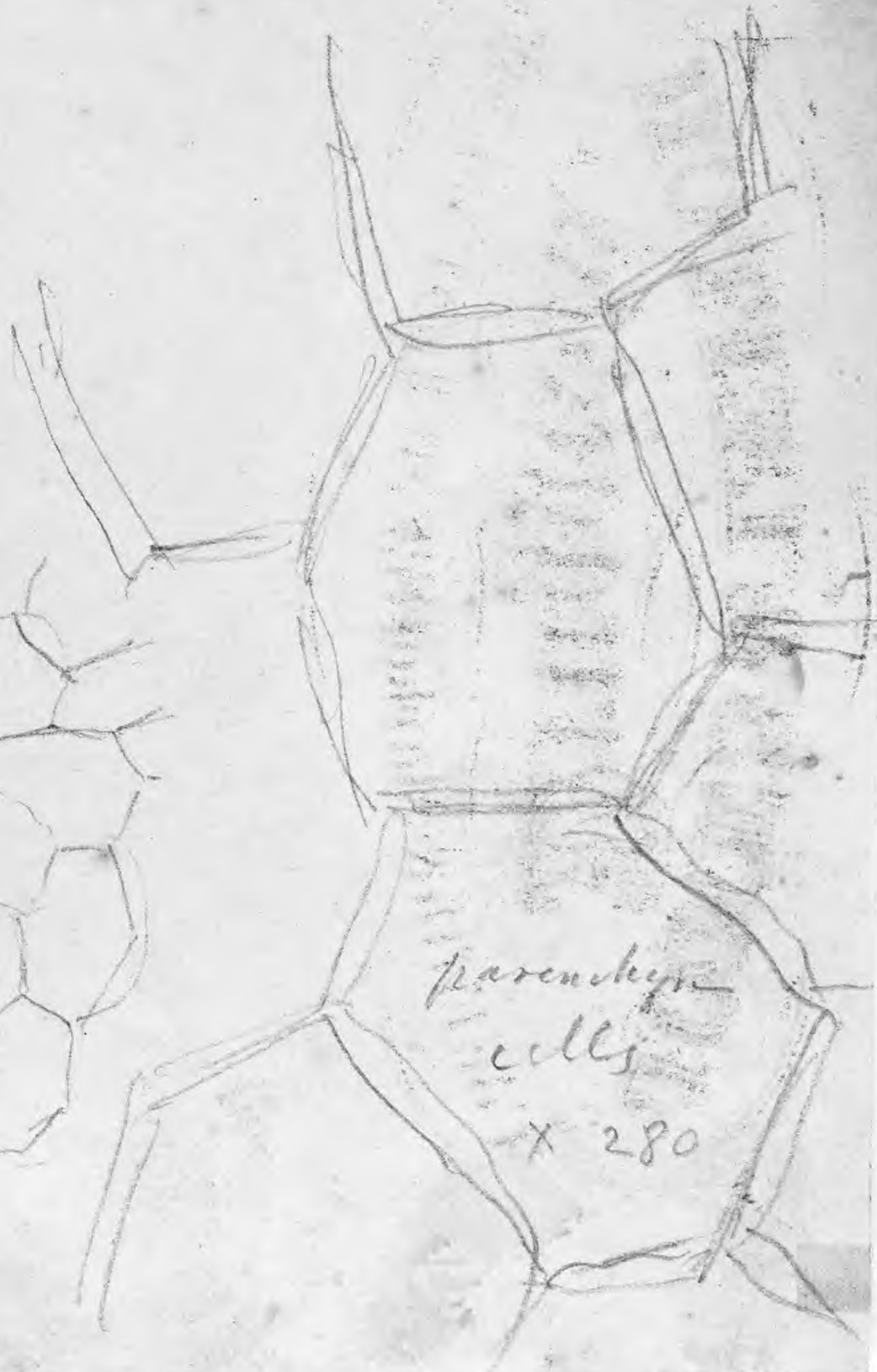


upper



lower

Surface x 280



parenchyma
cells

x 280



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7876

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

JONES & LETCH
Druggists
Cor. Fifth & Market Sts. ST. LOUIS, MO.

J. McKittrick & Co. 56 N. Main St.



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



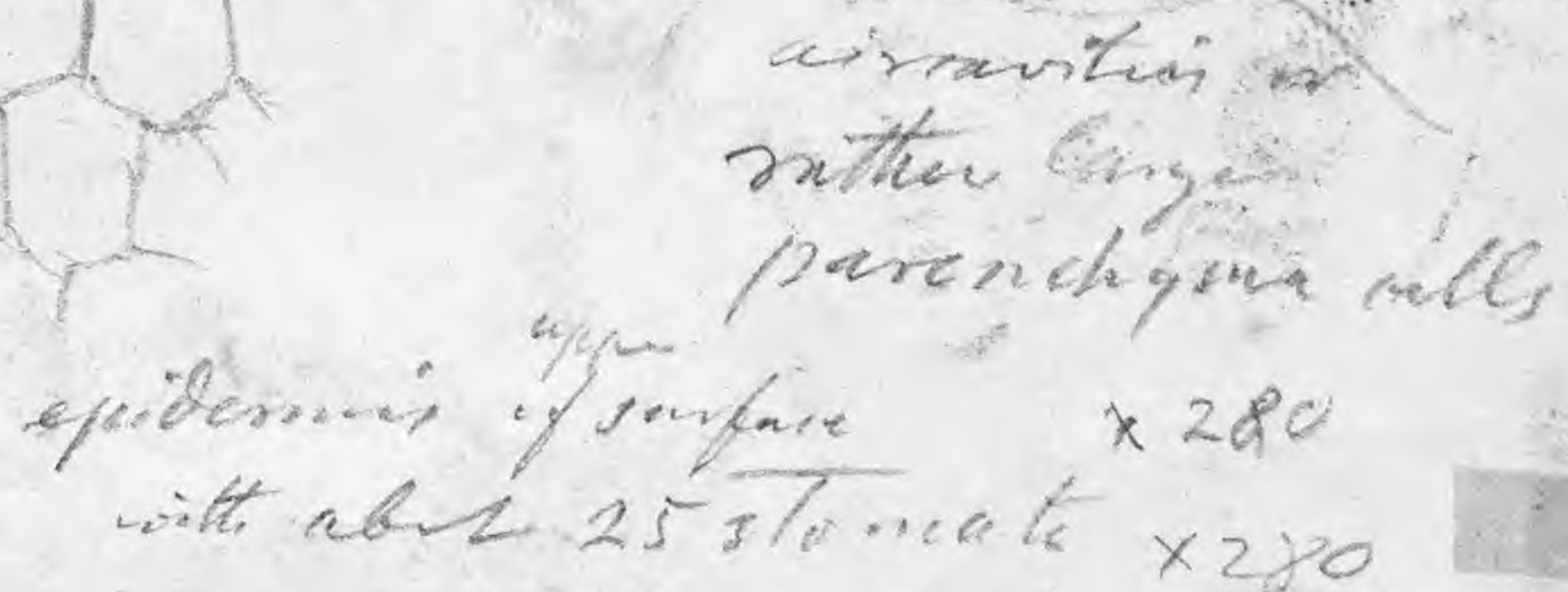
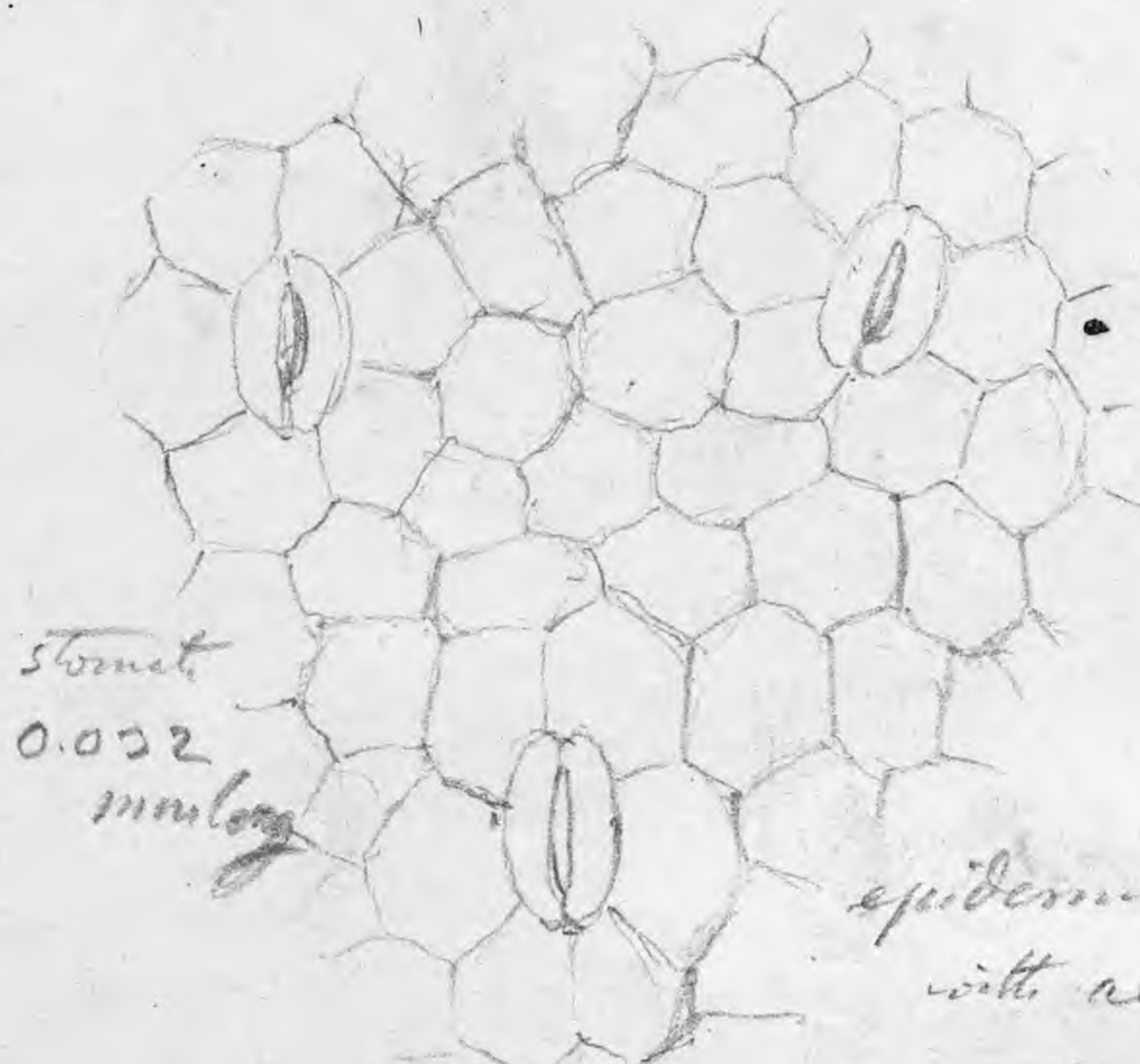
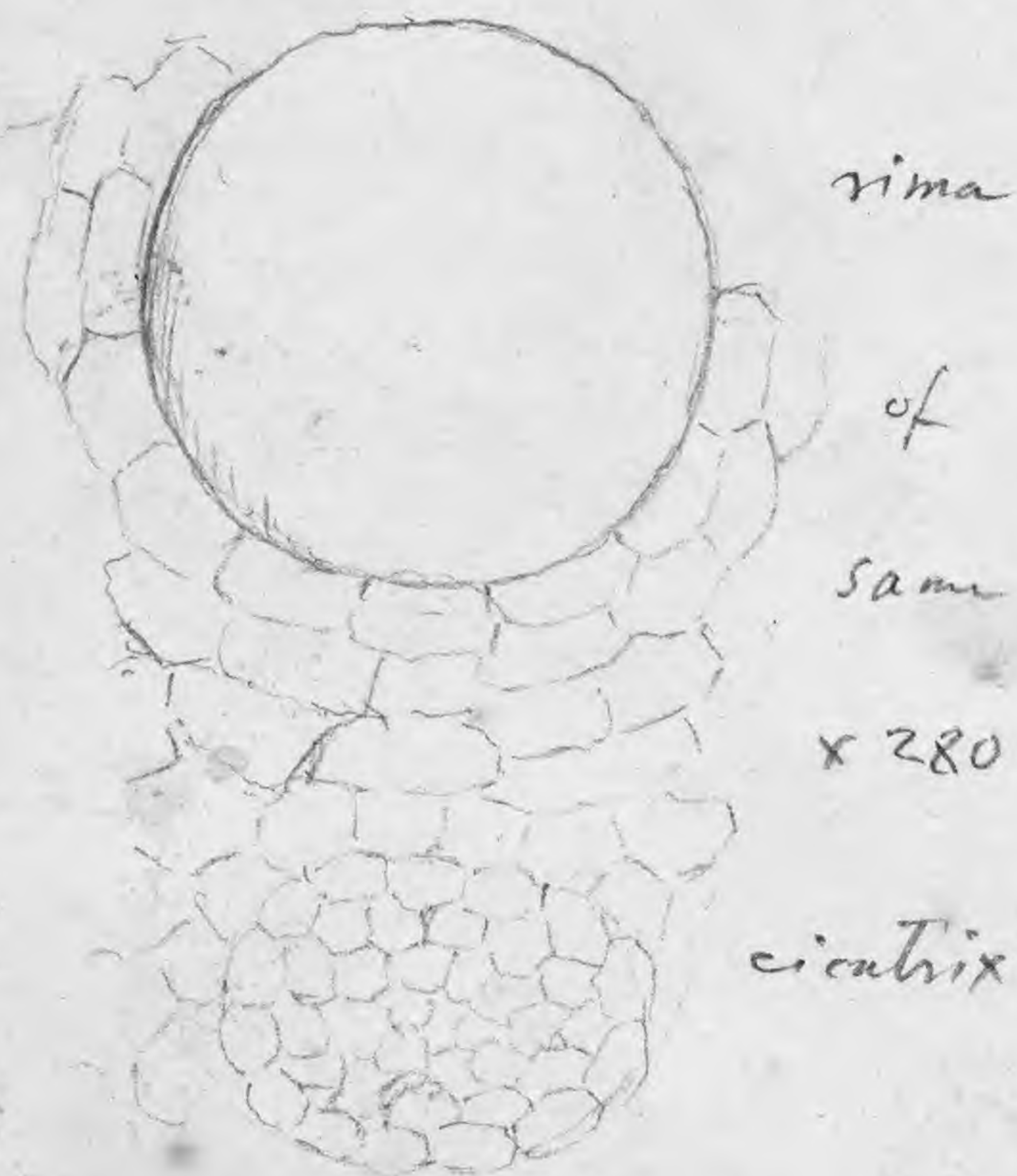
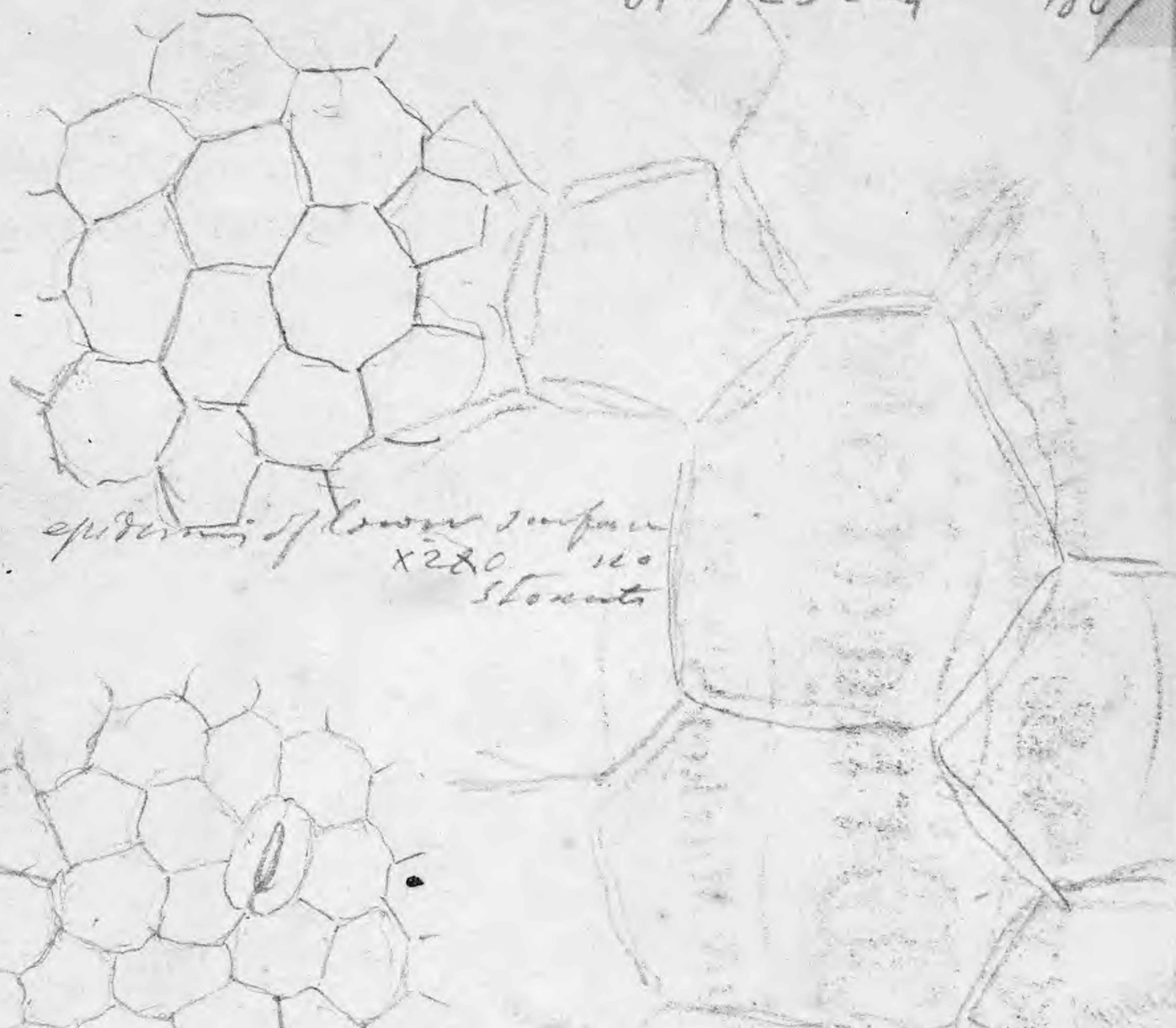
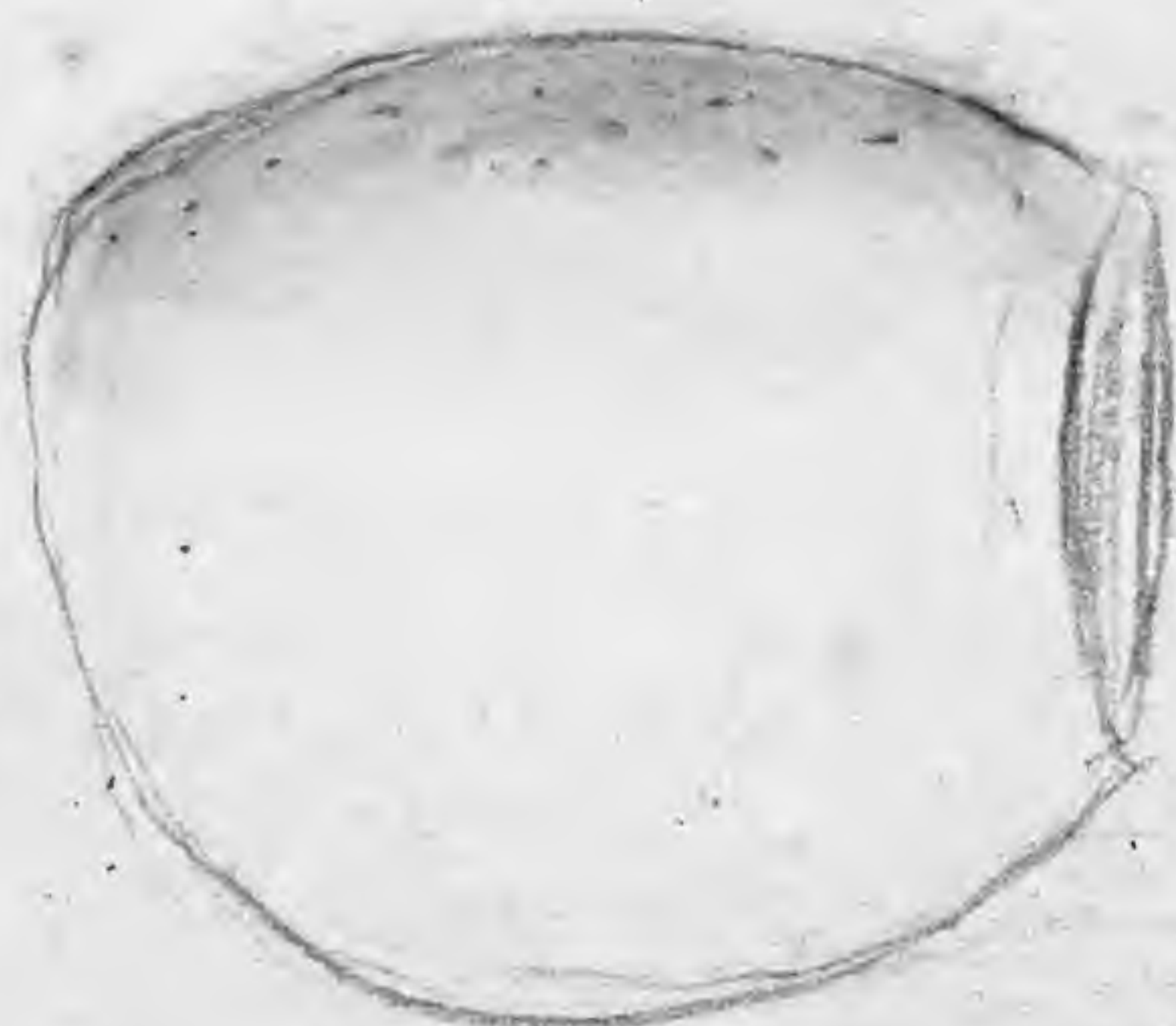
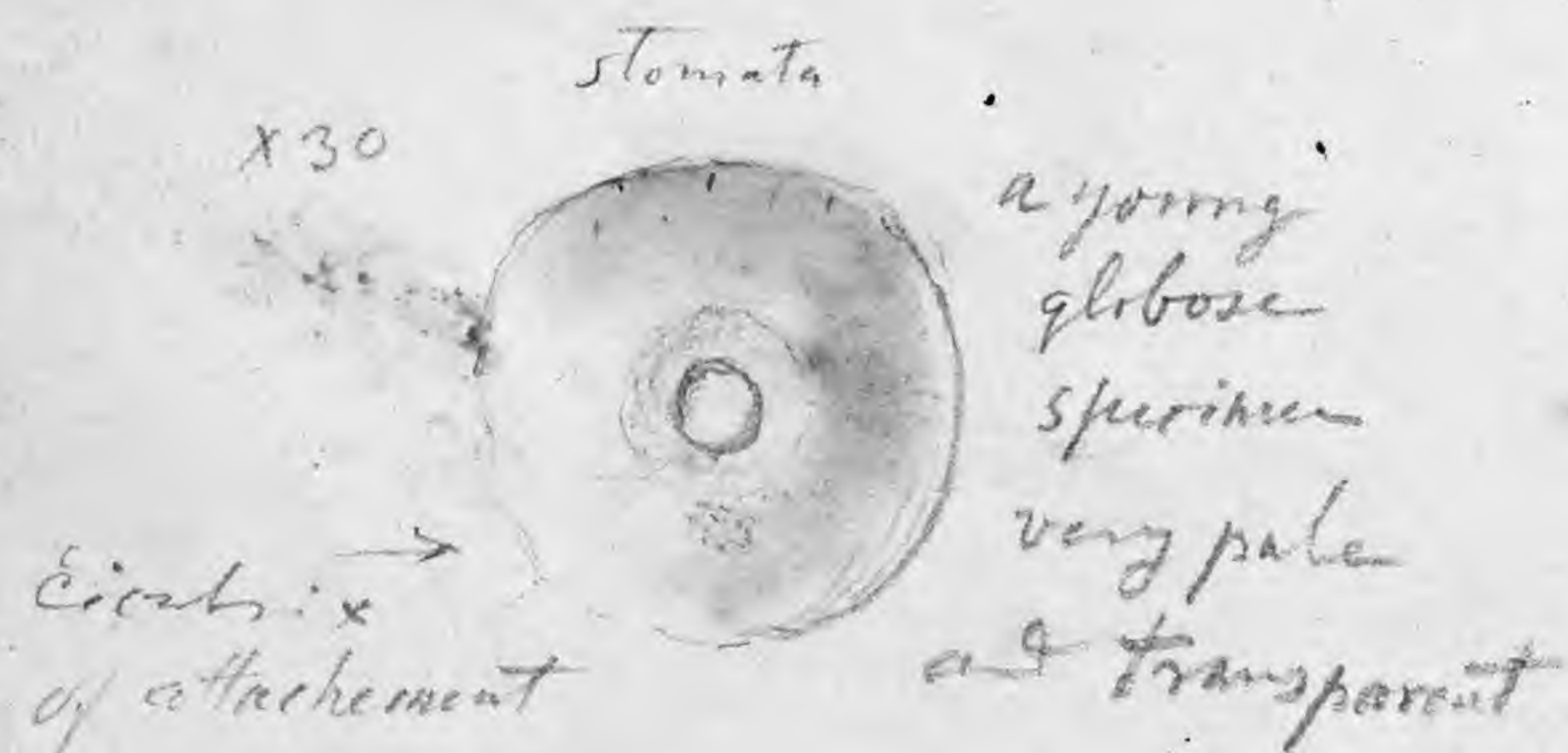
MISSOURI
BOTANICAL
GARDEN

Wolffia arrhiza

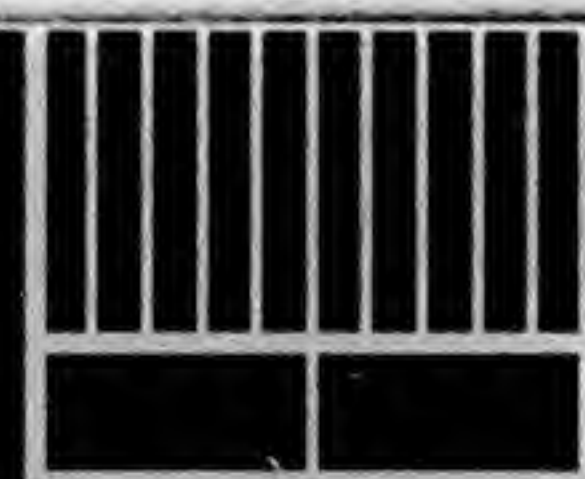
Bordeaux
Cesson

Aug 23-24

1867



upper surface green; lower transparent



0 1 2 3 4 5 6 7 8 9 10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

7877

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

JONES & LETCH

Druggists

Cor. Fifth & Market Sts. ST. LOUIS, MO.

J. M. H. H. & Co. St. Louis, Mo.



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

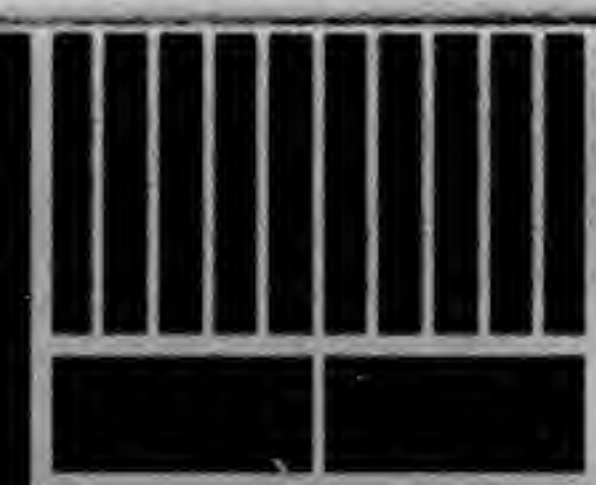
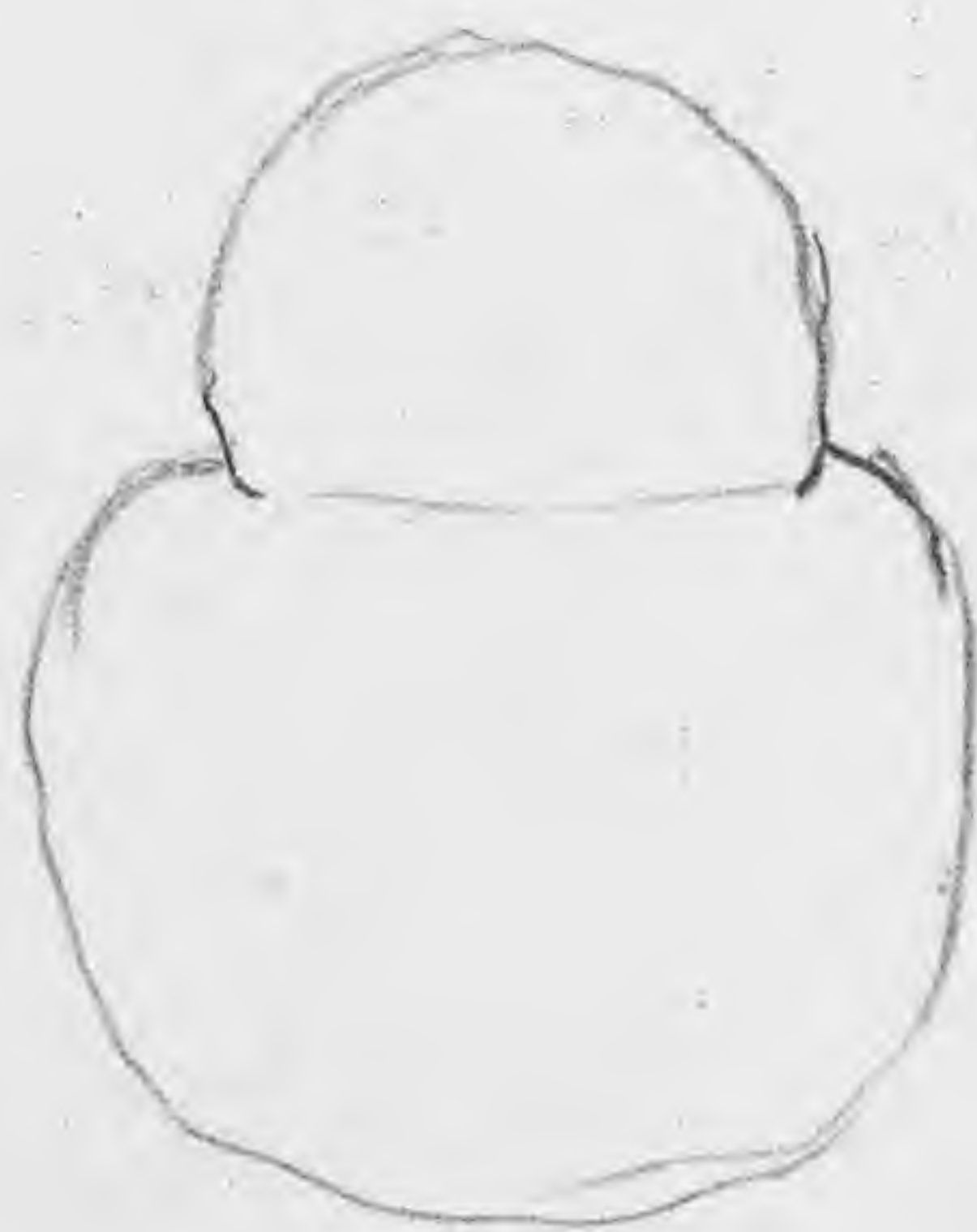
Wolffia arrhiza

July 4 1867

Bordeaux, Cosson mis.

soaked x30

quite transparent, green



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Alex. Leitch,
APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

7878



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

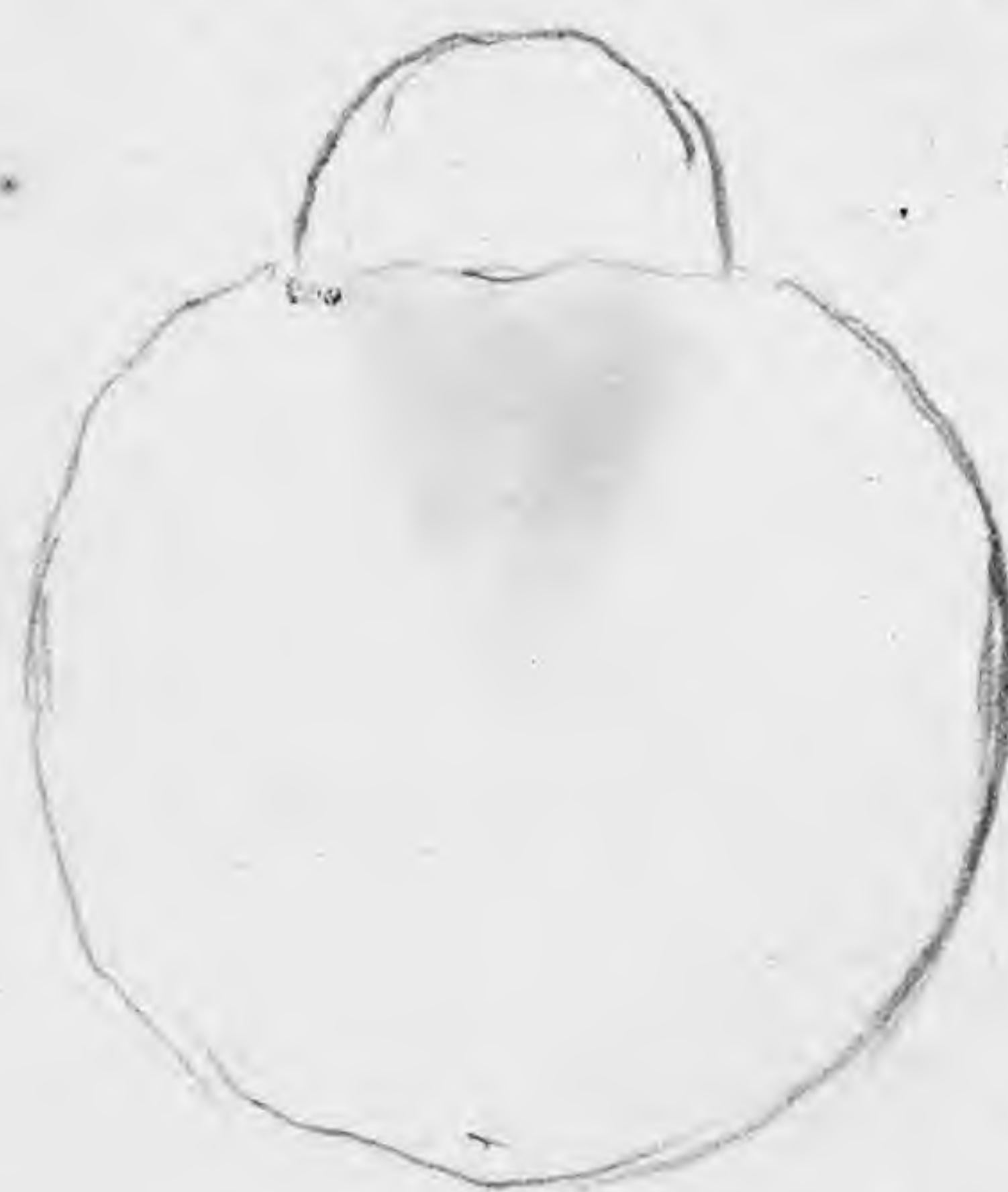
Wolffia arthiza

July 4 1867

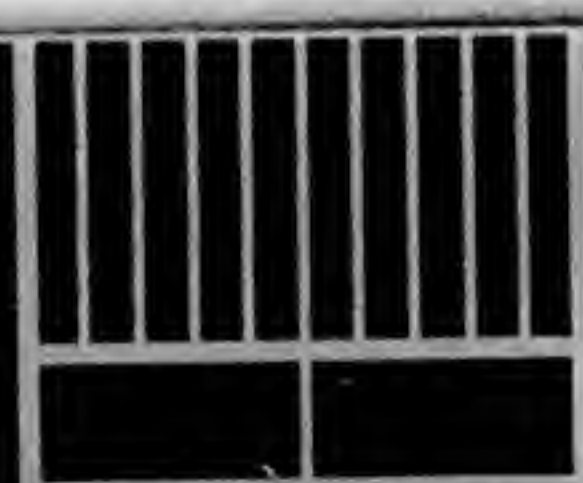
Leipzig, Bremen

different openings
well soaked, x 30

open, blackish



after treating these plants with
polish they become more green,
fuller, and a little larger



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN

Alex. Leitch,

APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

7879



0

1

2

3

4

5

6

7

8

9

10

cm

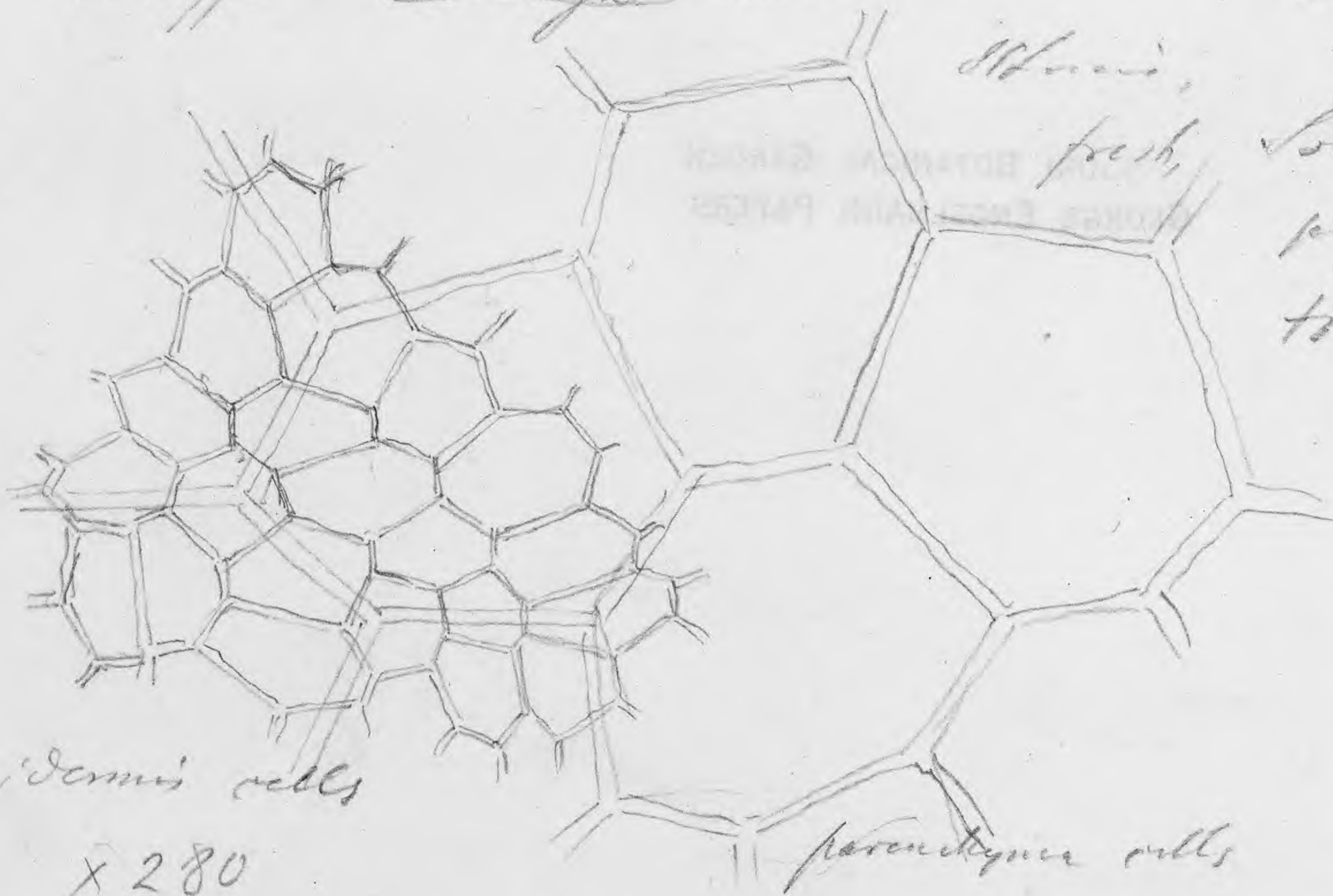
copyright reserved



MISSOURI
BOTANICAL
GARDEN

Wolffia arrhiza Columbus

July 5 - 1867



Stems,

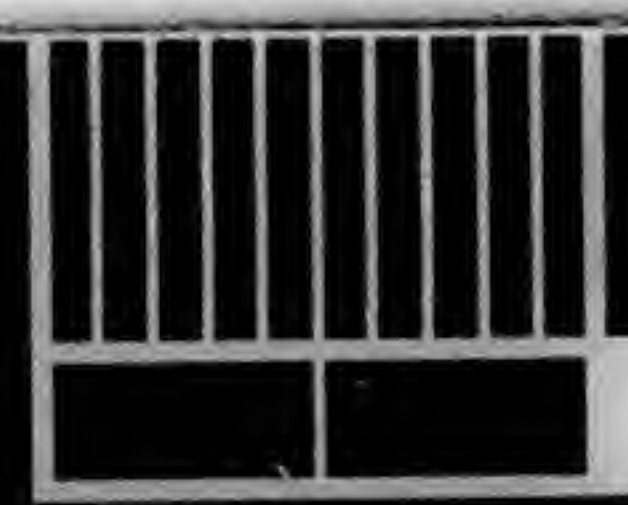
fresh,

Soaked in ether,
perfectly white,
tough.

epidermis cells

x 280

parenchyma cells



0
cm

1

2

3

4

5

6

7

8

9

10

copyright reserved



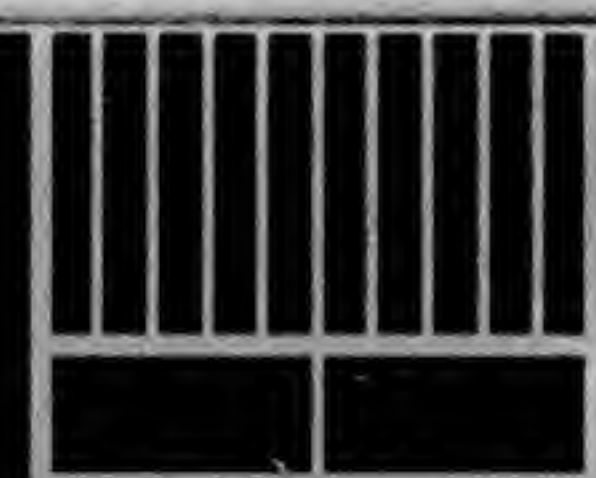
MISSOURI
BOTANICAL
GARDEN

Alex. Leitch,
APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

7880



0

1

2

3

4

5

6

7

8

9

10

cm

copyright reserved



MISSOURI
BOTANICAL
GARDEN